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U1S S2219(56) Documents cited
GB 1506457 A EP 0342317 A2 WO 88/02727 A1
US 5050272 A US 4887335 A(58) Field of search
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(54) Improvements in sealing of camera housings

(57) A sealing apparatus Fig. 3 e.g. for a camera housing comprises an elongate recessed member 1 and a rod 7 around which at least two layers 13, 15 of flexible material, e.g. parts of the housing, are wrapped and then inserted in the recess of the recessed member to form a watertight seal between the layers. As described the sealing apparatus is applied to a camera housing 71 for video cameras in the form of a bag which is provided with a lower portion having a lens port 73 and a viewing port 75 for co-operation with the lens and viewfinder of a camera and an upper portion in the form of an open flexible sleeve through which the camera can be inserted into the lower portion. The bag is preferably made of material e.g. neoprene which allows the camera to be operated whilst inside the bag. The housing enables the camera to be used near or under water, or on the beach without danger of damage.

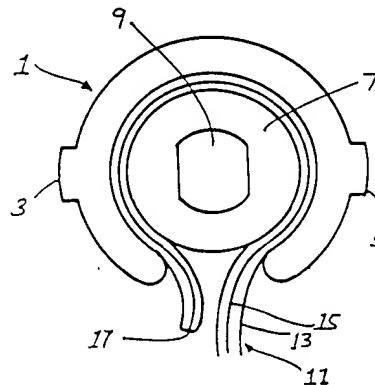


FIG. 3

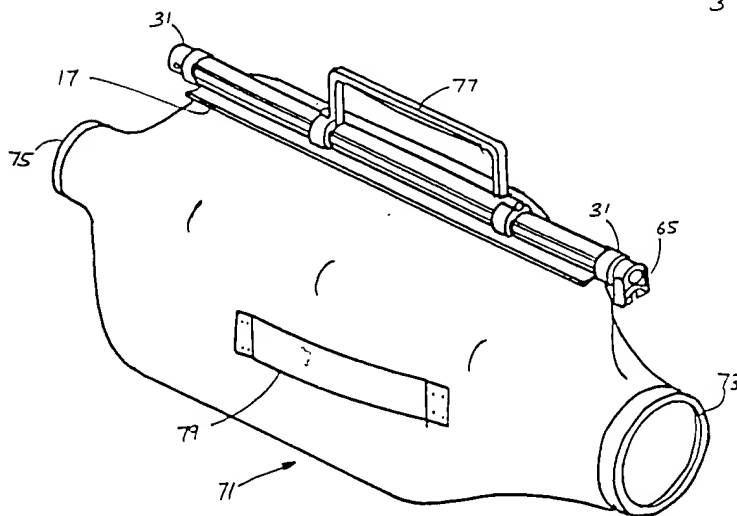


FIG. 10

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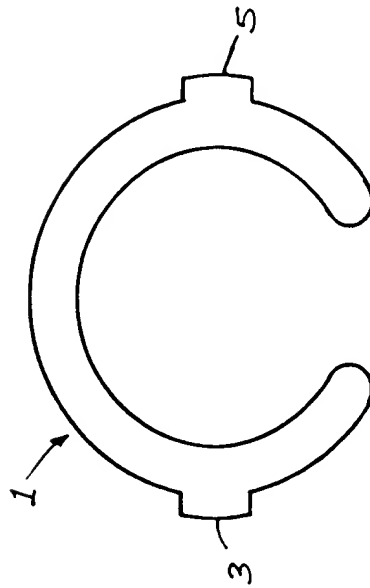


FIG. 1.

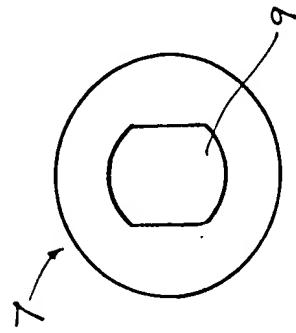


FIG. 2

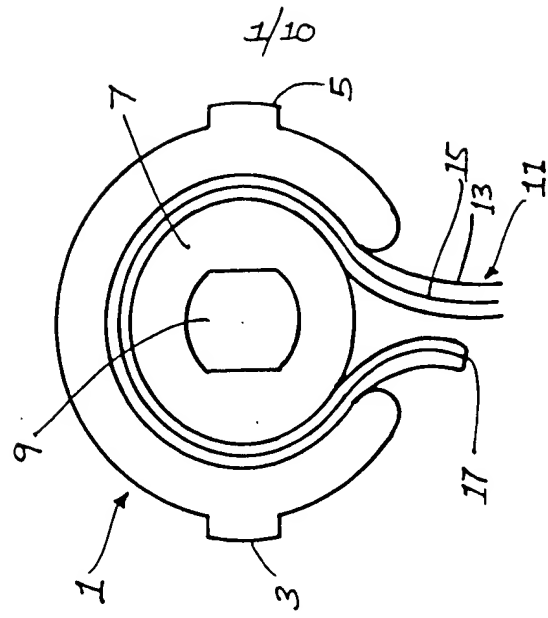


FIG. 3

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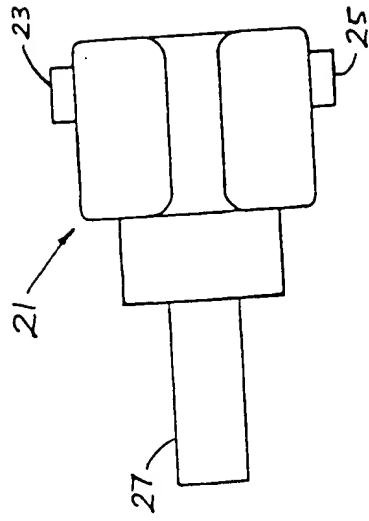


FIG. 4C

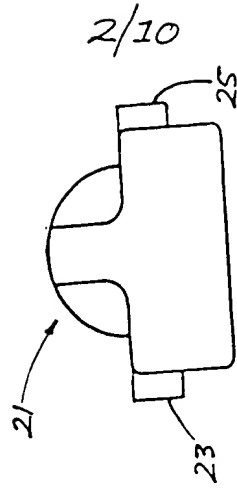


FIG. 4B

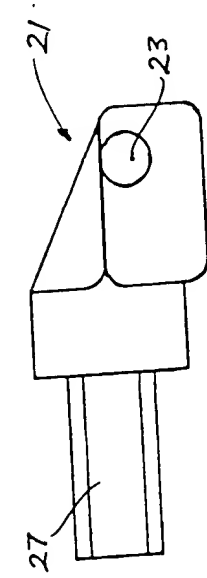


FIG. 4

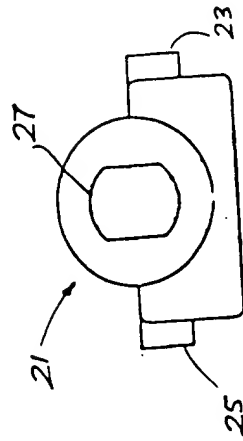


FIG. 4A

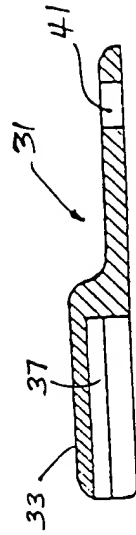
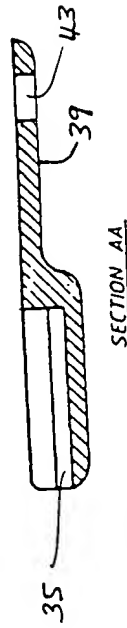


FIG. 5A



SECTION AA

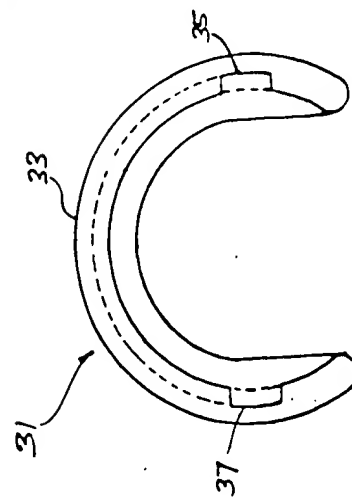


FIG. 5B

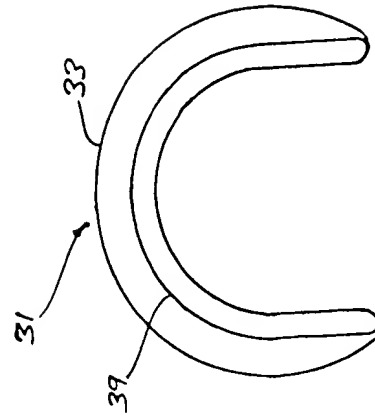


FIG. 5C

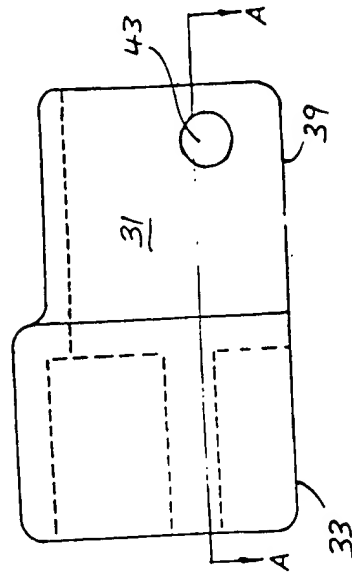


FIG. 5

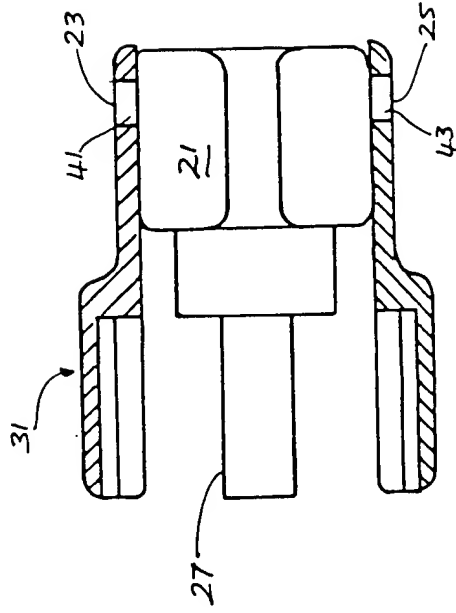


FIG. 6A

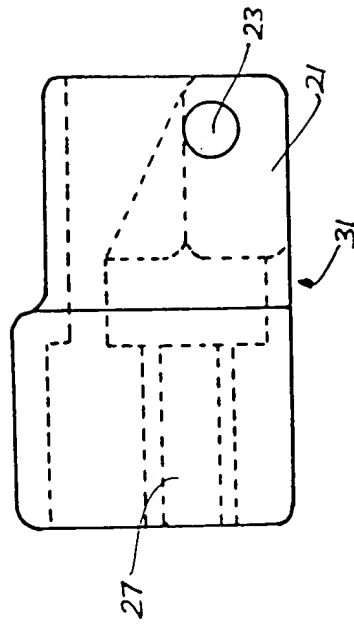
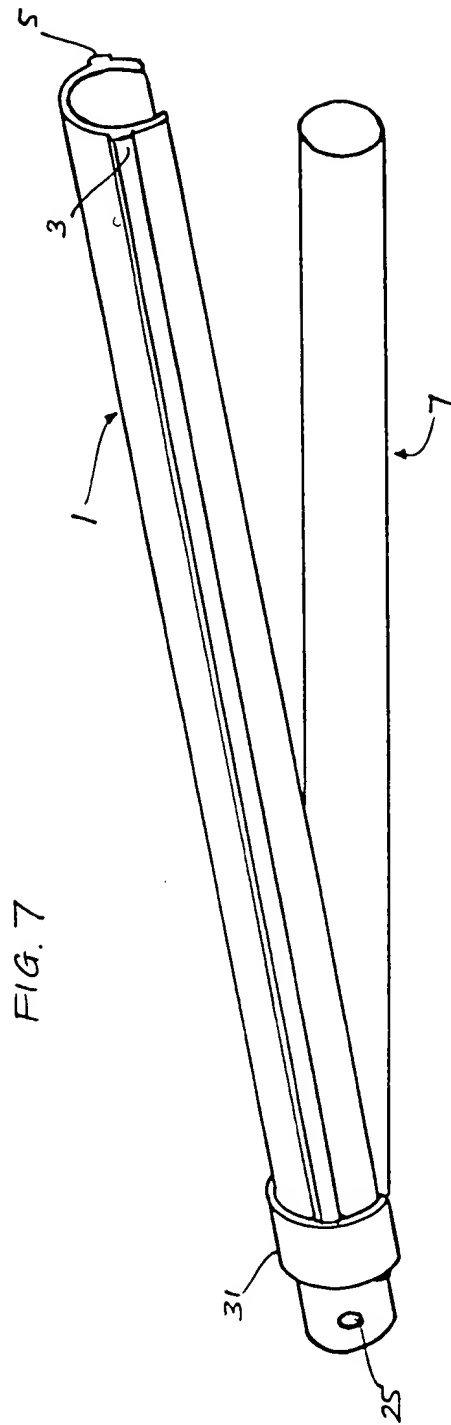


FIG. 6

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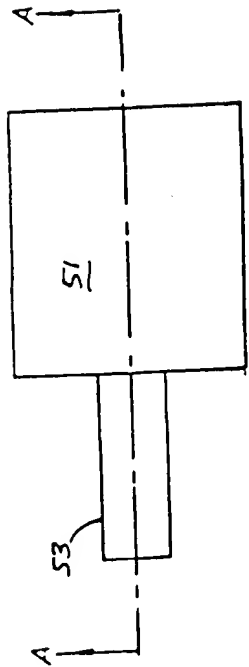
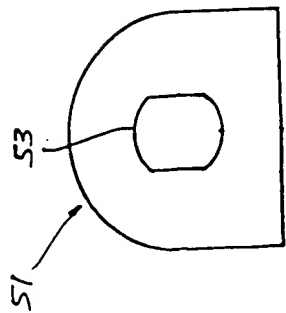


FIG. 8A

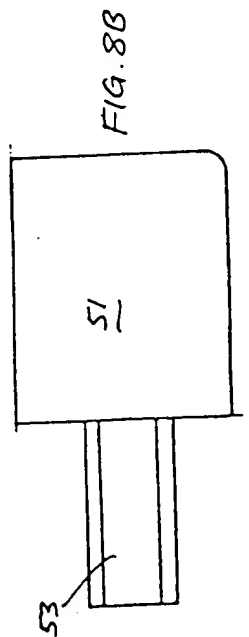


FIG. 8B

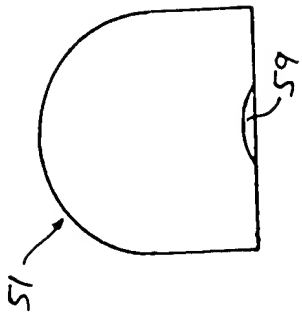


FIG. 8D

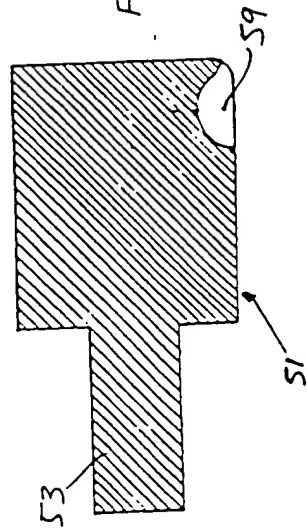
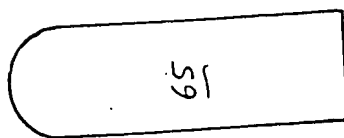
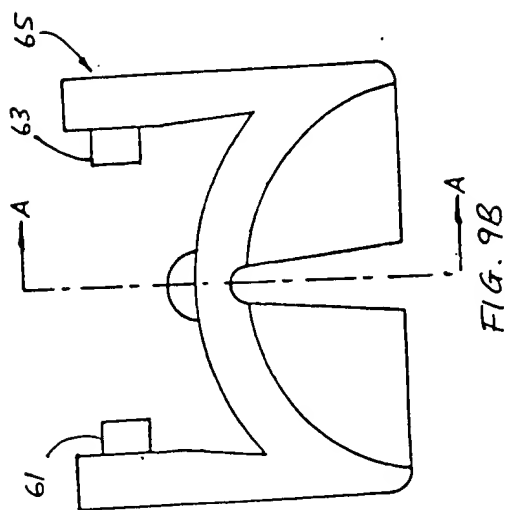
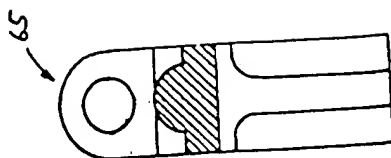
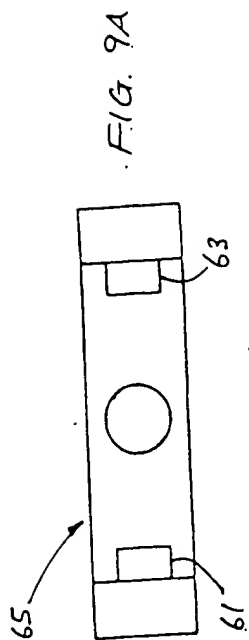


FIG. 8C

FIG. 8



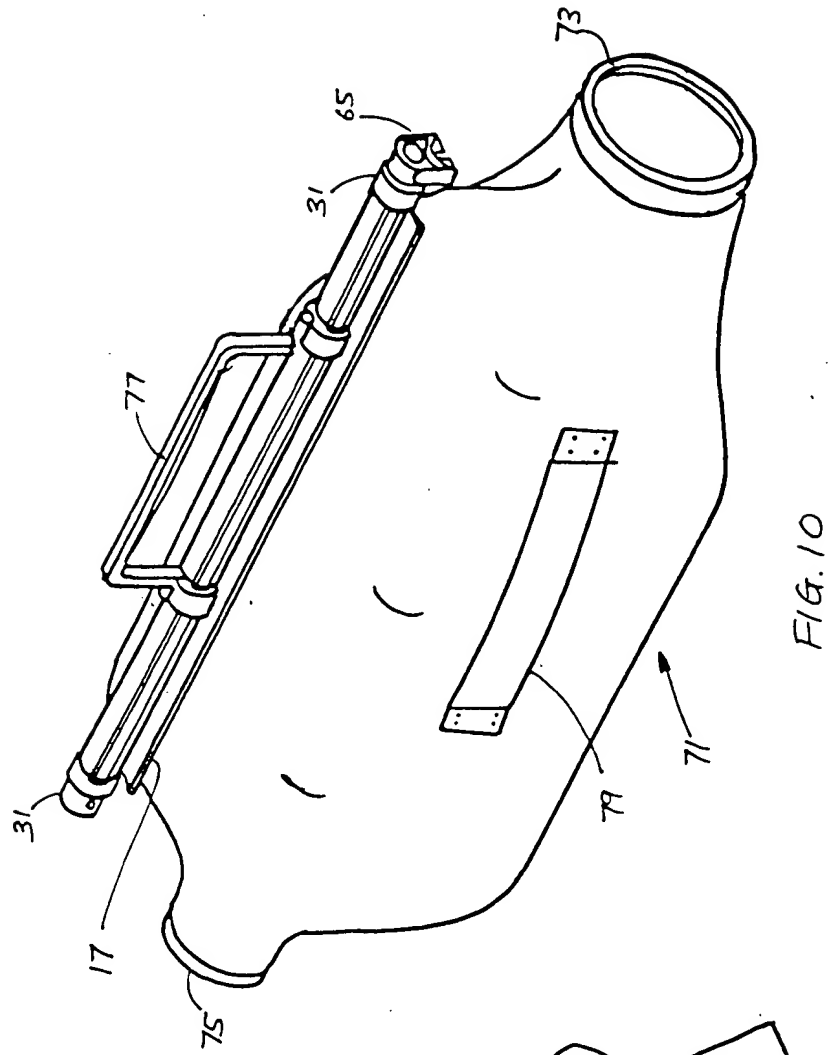


FIG. 11

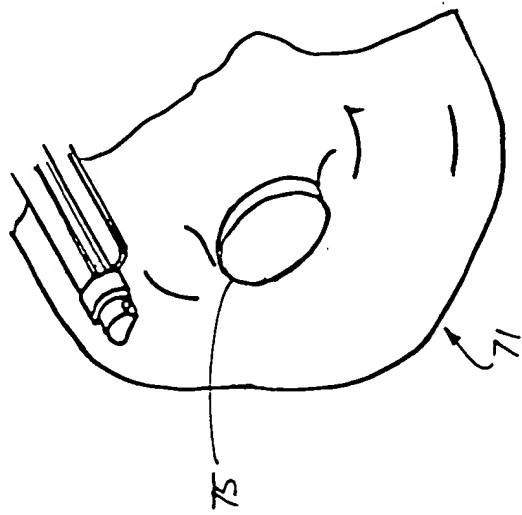


FIG. 12

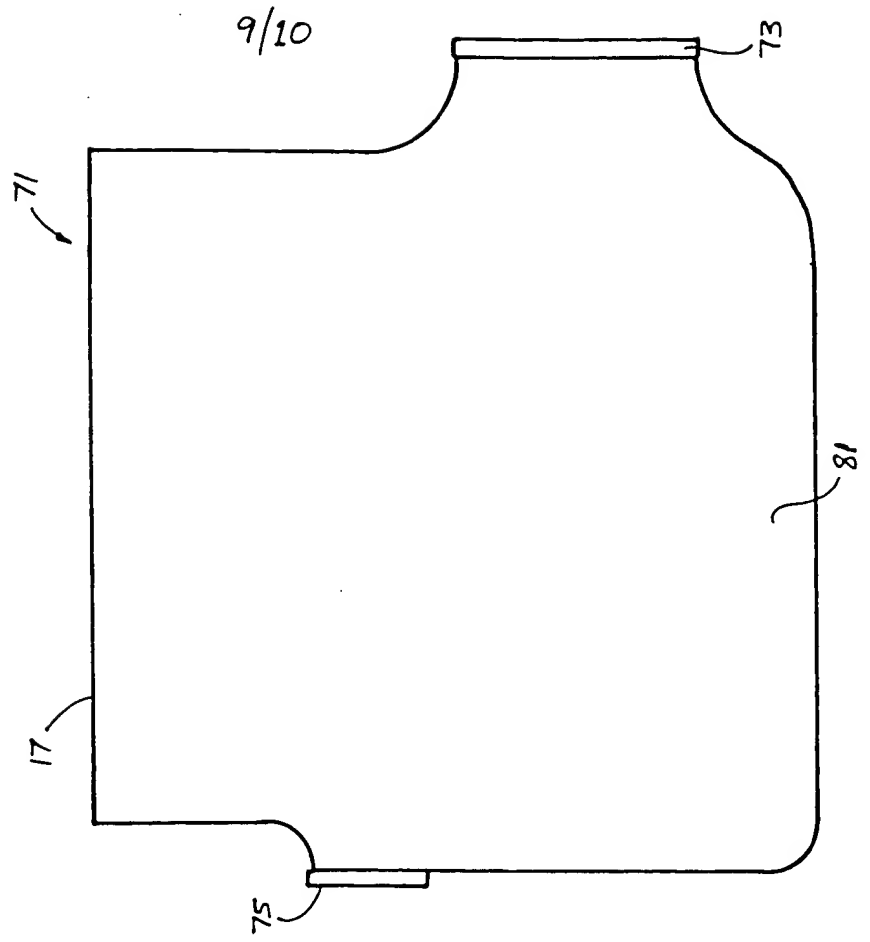
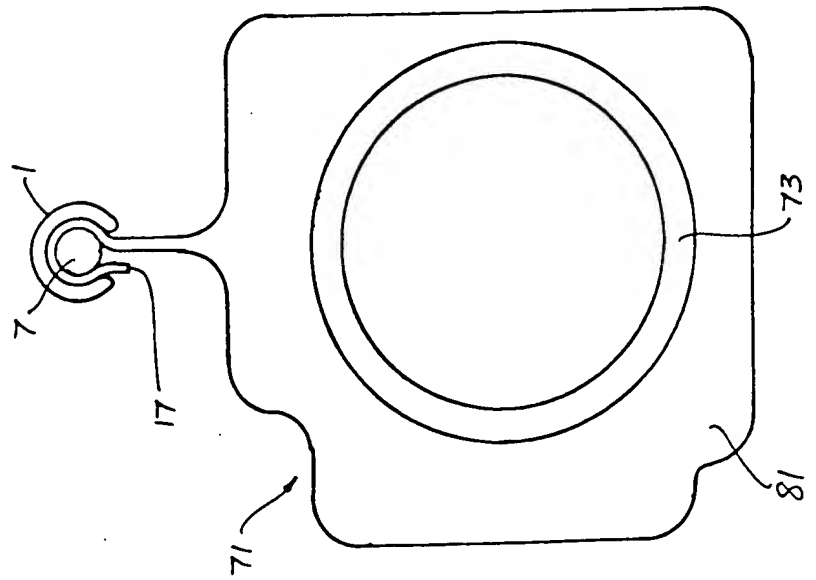
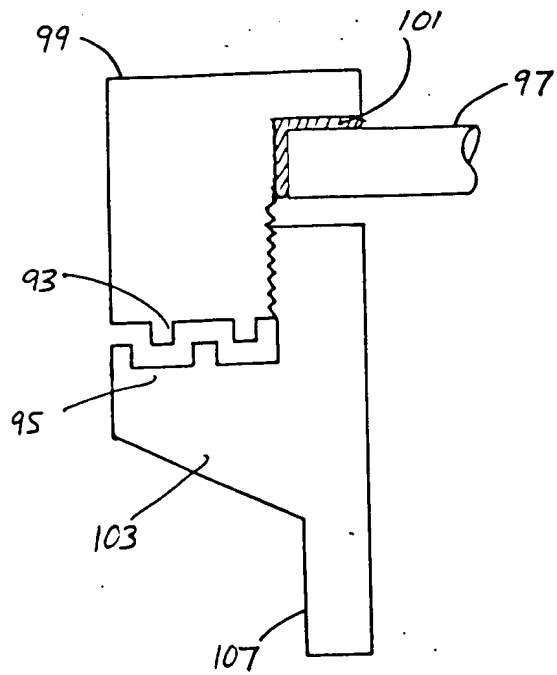
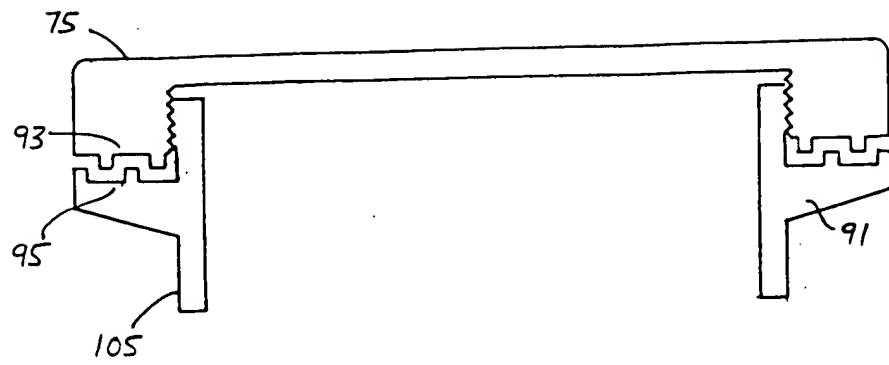


FIG. 13





- 1 -

IMPROVEMENTS IN OR RELATING TO CAMERA HOUSINGSBACKGROUND OF THE INVENTION1. Field of the invention

The present invention relates to re-sealable housings for
5 protecting cameras, for example, video cameras and
broadcasting cameras.

2. Description of the prior art

Photography is a very popular hobby for many people. A high
proportion of the population either own or have access to a
10 camera. In addition, many households now own video recorders,
and in recent years there has been a rapid increase in the
ownership of portable video cameras, commonly referred to as
camcorders.

Cameras, especially video cameras, can be expensive to
15 purchase and can be easily damaged. Many people are therefore
reluctant to use them in situations where they might come into
contact with materials which could harm them. One of the more
hazardous locations for using these cameras is on the beach
where there is a high risk of damage caused by sand and/or
20 water. This is a considerable nuisance, because more often
than not the beach is the place where people like to take
photographs or make video recordings.

A number of solutions to this problem have been proposed, in
particular, it is possible to purchase waterproof housings for
25 the cameras. However, some of these waterproof housings suffer
certain drawbacks, for example, some are difficult to assemble
and, for the average person therefore, operationally
impractical. Others require stringent manufacturing processes,
for example, the making of watertight zip fastenings, and this
30 in turn leads to high manufacturing costs. A further

disadvantage is that there are few housings available at an affordable price which allow the camera operator to use the equipment under the surface of the water, for example, when snorkelling.

5 SUMMARY OF THE INVENTION

Accordingly, the main object of the present invention is to provide a waterproof camera housing which is easy to assemble, allows the camera to be used underwater and is relatively inexpensive to manufacture.

- 10 It is a further object of the invention to provide a method of sealing an open flexible container such that the resulting seal is watertight.

Expressed in another way, it is an object of the invention to provide apparatus for providing a watertight seal between at
15 least two portions of flexible material.

- To this end, the present invention consists in sealing apparatus comprising an elongate recessed member and a rod which in use is wrapped with at least two layers of flexible material and inserted in the recess of the recessed member to
20 form a watertight seal between said at least two layers of flexible material.

The present invention also consists in a method of providing a watertight seal across an opening in a container made from
25 flexible material, said method comprising wrapping around a rod the material adjacent to but spaced from said opening, inserting said rod into a recess of a recessed member such that said recessed member holds said flexible material around said rod in a watertight manner.

- 30 By means of the invention, there is co-operation between the rod and the elongate recessed member through the layers of

flexible material interposed therebetween such that a watertight seal is formed across the said layers.

- The rod may be rigid or may have some degree of flexibility and may be made from any suitable material such as metal or
- 5 plastics. It is more economical to manufacture the rod from plastics material, and polyurethane is particularly preferred. More preferably, the plastics rod may be provided with an elongate metal insert, such as aluminium, to provide added strength and rigidity.
- 10 The cross-section of the rod can be any convenient shape, but preferably does not have any sharp edges which could damage the flexible material from which the container is made. By rod is meant any member having an elongate portion which can be received within the recess of the recessed member. For
- 15 example, at one extreme the rod may be substantially rectangular in cross-section with the corners rounded off, or at the other extreme may be annular, or more especially circular, in cross-section. Other cross-sectional shapes such as hexagonal, heptagonal and the like are also possible.
- 20 Preferably, the rod is made from a plastics material and is circular or generally U-shaped in cross-section, either form having a hollow centre which is generally rectangular in cross-section but with one pair of opposite sides being arcuate and into which is inserted a metal rod whose shape is
- 25 the same as that of the hollow. In addition to an excellent holding or gripping action, the presence of the shaped metal insert substantially eliminates any potential for the rod to twist or distort as it is pressed into the recessed member. While the metal insert may extend for the full length of the
- 30 plastics rod, preferably the insert stops short of one or both ends to allow various attachments such as those described below to be inserted.

The recessed member, by which is meant a member having a recess, is provided with a recess for receiving the rod with

material wrapped around. Preferably, the recessed member is elongate with the recess extending along the longitudinal axis thereof. In cross-section, the internal dimensions of the recessed member are such that the rod with the layers of flexible material wrapped around is held firmly against at least a part of the interior of the recess thereby applying pressure across the layers of material to force them together to provide a watertight seal. The recessed member and the rod with the flexible material wrapped around may, for example, apply pressure on the layers of material held therebetween in at least two spaced apart locations in cross-section thus providing two lines of continuous contact along the length of the material. More preferably, the recessed member holds said rod in such a way that pressure is applied to the layers of material along a substantially continuous length in cross-section.

When the rod is circular in cross-section, the recessed member is preferably also substantially circular in cross-section. However, a recessed member which is generally U-shaped in cross-section is also suitable for co-operating with a circular cross-section on the rod.

The recessed member may also be made from any suitable material. While a rigid recessed member can perform its function adequately, it is preferred to use a material having a degree of resilience. Plastics materials are particularly suitable and polyurethane is preferred. In this way, as the rod with the flexible material wrapped around is pushed into the recess in said recessed member the walls of the recess are forced apart and after introduction the resilience of the recessed member is such that the walls flex back to press against the flexible material around said rod.

The gripping action of the recessed member is such that the sides of the flexible material which are adjacent to but spaced from the opening are held together under pressure

thereby producing a watertight seal along the whole length of the opening. Moreover, the pressure applied to the material by the combination of the recessed member and the rod means that the material is, under normal circumstances, prevented
5 from slipping around the rod so that there is little danger of the assembled parts coming apart accidentally.

The co-operation between the rod, the recessed member and the flexible material is such that a watertight seal is produced. In the embodiment described above, the resilience of the
10 recessed member provides a gripping action which applies pressure across the layers of material to produce the seal. Of course, a similar effect may be achieved by constructing at least the outer surface of the rod member of resilient material. Moreover, when neither of the rod member nor the
15 recessed member are made from resilient material, the gripping action stems from the resilience of the flexible material interposed therebetween. In other words, it is the resilience of the recessed member, the rod or the flexible material or any combination thereof which provides the seal.

20 While the type of flexible material which can be used to achieve the watertight seal of the present invention is not limited, it is preferred to use flexible materials which have at least some degree of resilience. Natural and synthetic rubbers are particularly preferred, layers of these materials
25 being easily compressible under the application of pressure to form a watertight seal therebetween. The seal formed by these rubbers may remain watertight down to depths of at least 2 to 3 metres below sea level.

While the rod and recessed members are usually, but not
30 essentially, of comparable length, in order to make disassembly of the parts easier, it is preferred that the rod extends in use beyond the end of at least one of the ends of the recess member. Thus when disassembling the sealing apparatus, the operator can pull on the portion of the rod

member which extends beyond the end of the recessed member.

Although in use the contact between the parts results in the assembly generally being held together without further assistance, if desired further securing means may be provided
5 for added security to prevent relative movement between the parts. Said means may prevent the assembly either coming apart or sliding in the longitudinal direction or both.

The further securing means may be provided anywhere along the length of the assembled parts, but is preferably situated at
10 or towards one or both ends of the elongate recessed member. The securing means may for example comprise a simple catch mechanism or a clamping member wherein a bolt or the like is progressively tightened against the external surface of the recessed member. Preferably, the further securing means is
15 provided by one or more end caps which slide or pivot over one or both ends of the assembled recessed member and rod and remain thereon by friction. Alternatively, the end caps may be a snap fit over one or more projections provided on the exterior surface of the recessed member. Most preferably, the
20 securing means is provided by a pivoting catch member on one end of the recessed member which co-operates with retaining means on the corresponding end of the rod. The retaining means may be integral with the end of the rod, but preferably comprises a separate member which is attached to the end of
25 the rod, for example by means of an extension which is retained in the hollow centre at the end of the rod where the metal insert does not extend. Any suitable means may be used for retaining the extension in the hollow centre, for example, by use of adhesive or simply by friction. It is however
30 preferred to use high frequency welding to maintain the parts together.

In order to facilitate use of the sealing apparatus of the invention it is preferred to provide attachment means between the recessed member and the rod, thereby ensuring that both

parts are to hand when ready for use. The attachment means must not interfere with the wrapping of the flexible material around the rod member. Most advantageously, this is achieved when the recessed member is pivotally attached at one end to
5 the rod member.

The pivoting means may form an integral part of the rod and recessed member, but preferably is comprised of a separate pivot block which is attached to the end of the rod, for example, by means of an extension which can be inserted in the
10 hollow centre of the end of the rod where it is retained by any suitable means, and an end cap attached to the end of the recessed member, for example, by snap fitting over the member, the pivot block and end cap being attached to each other in pivotal relationship. Again, the extension of the pivot block
15 is preferably retained within the hollow centre of the rod by means of high frequency welding, but other means may be equally effective.

By providing the pivoting means in the form of attachments to the rod and recessed member, it is possible to manufacture the
20 rod and recessed member as continuous extrusions which can then be cut to the desired lengths thus offering considerable savings in manufacturing costs.

From another aspect, the present invention resides in a container having a flexible sleeve defining an opening wherein
25 sealing means comprising first and second clamp members co-operate to close around the flexible sleeve to seal the opening.

From a further aspect, the present invention consists in a camera housing, said housing having a flexible opening through
30 which a camera can be introduced and characterised in that said opening is sealed by means of sealing apparatus as described herein above.

Preferably, the housing is made from a flexible, waterproof material, the controls of the camera being operable through the material.

Moreover, the housing is advantageously specially shaped to
5 accommodate a camera, for example, it is provided with a main body which generally follows at least some of the major contours of the camera with which it is intended to be used.

In order to facilitate use of the sealing apparatus of the invention, it is preferred to provide the opening in a sleeve
10 of material extending from the main body of the housing. This is most easily achieved when the housing is generally in the form of a bag, with the lower portion of the bag forming the main body, and the opening formed at the top of the sleeve extending from said main body.

15 More preferably, the present invention consists in a waterproof camera housing made from a flexible, waterproof material, the flexibility of the material being such that the camera controls are operable through the material when the camera is accommodated in the housing, and comprising a main
20 body which is shaped to accommodate a camera, an opening in a sleeve of material extending from said main body through which the camera may be inserted, said main body being provided with a lens port and a viewing port to co-operate with the lens and viewfinder of the camera, said opening being
25 closed by means of any of the sealing apparatus as described herein above.

By means of this invention, it is a simple matter to place the camera in the main body of the housing, locate the lens port and viewing port over the lens and viewfinder of the camera
30 and close the opening by means of the waterproof sealing apparatus described above.

Usually, when sealed, the housing contains sufficient air to

provide buoyancy in the water, but if it is desired to use the camera some distance under the surface of the water, the housing may be provided with a valve through which the air can be withdrawn.

- 5 The main body of the housing may be of any shape capable of accommodating a camera, but is preferably shaped so as to substantially follow at least some of the major contours of the camera with which it is intended to be used. In this way, it is easier to place the camera within the housing so that
10 the lens port and viewing port of the main body are in close proximity to the lens and viewfinder of the camera ready for co-operation therewith. Furthermore, when the main body is so shaped to follow the major contours of a particular form of camera it is easier for the operator to use the controls on
15 the camera through the flexible material of the housing.

The housing may be made from any suitable flexible material, for example, it may be a natural or synthetic material, and it may be transparent or opaque. Preferably, the material is also waterproof. Examples of materials which may be used are
20 laminated pvc foil and polyurethane-coated "Nylon" (Trade Mark). However, it is preferred to make the housing from a flexible, waterproof material which has at least some degree of resilience. Most preferably, the material should be stretchable.

- 25 From another aspect, the present invention consists in a camera housing comprising a waterproof, flexible, stretchable material. The currently preferred stretchable materials in accordance with the invention are natural or synthetic rubbers.

- 30 Although natural and synthetic rubbers are not transparent and therefore the operator must be familiar with the positions of the camera controls, this disadvantage is more than offset by the benefits provided by the properties of these materials.

In particular, the resilience and degree of stretch which rubber can provide means that the housing can be stretched to permit introduction of the camera, once introduced the rubber reverts to its original shape which closely follows the
5 contours of the camera, and the resilience ensures that an excellent watertight seal can be achieved.

Furthermore, the regions of the housing in proximity to the viewing port and lens port can be stretched to allow the lens and viewfinder of the camera to be brought into co-operating
10 relationship. Once in position the resilience of the rubber urges the parts to remain in co-operation. Not only does the flexibility offered by the use of rubber accommodate the relatively short movement of the lens during focusing, there is sufficient stretch in the material to accept the camera
15 when fitted with various attachments such as a telephoto or wide-angle lens. This degree of resilience cannot be achieved to the same extent by use of currently available transparent materials known to the applicant, but the invention does not exclude the possibility of such transparent materials becoming
20 available.

Of the various types of rubber available for use, it is preferred to manufacture the housing from a synthetic rubber, such as neoprene, because it is more inert than natural rubber. In particular, neoprene does not decay on exposure to
25 strong sunlight and it offers good resistance to oily substances. Neoprene is therefore an ideal material for use on the beach or in the sea.

The shaping of the rubber or latex housing to provide a main body which follows at least some of the major contours of the
30 camera may be easily achieved by dip-coating using a former which has the desired shape. The dip-coating technique provides accurate tolerance such that housings of uniform thickness can be reliably produced.

The opening is preferably created in the flexible material at a position which is adjacent to but a sufficient distance from said main body in order to allow the material around the opening to be pressed together and wrapped around the rod
5 member of the sealing apparatus described herein above.

The opening is preferably in the form of an elongate opening in the flexible material, for example like the top of a bag, since this enables the camera to be introduced into the housing and makes it easy to wrap the material adjacent to the
10 opening around the elongate rod of the sealing apparatus. Most preferably, the elongate opening extends for substantially the entire length of the main body.

After the dip-coating has taken place and the latex cured, the latex can be peeled off the former to produce the basic
15 housing. The lens port and viewing port are then fitted to the shaped latex.

The ports are positioned for easy alignment with the lens and viewfinder on the camera. While the position of the lens on a camera, such as a video camera, does not usually vary much
20 between the different models available on the market, the position of the viewfinder invariably does. For example, the viewfinder may be central in alignment with the lens, or may be off-set to the left or right. These differences can be accommodated by using different formers to shape the latex for
25 the various models.

On some cameras, the viewfinder is moveable along an arcuate path, and in these circumstances, it is preferred to provide a bellows arrangement in the flexible material in the region of the main body of the housing where the viewing port is to
30 be situated. Such a bellows arrangement can accommodate the viewfinder in all its operative positions.

The ports themselves are made from any appropriate transparent

material, "Perspex" (Registered Trade Mark) being particularly suitable for reasons of strength and lightness. The lens port and viewing port may be attached in any suitable watertight manner to the flexible material. For example, they may be fixed to
5 the material by means of outer and inner rings which clamp the material of the housing between them in a watertight manner. The rings may be made of any suitable material, but for reasons of lightness and cost, it is preferred that they are made of plastics. The clamping effect may be achieved, for
10 example, by means of screws which pass through countersunk holes in the outer ring and into screw threaded holes in the inner ring. More preferably, the clamping effect can be achieved using a complementary threaded arrangement on the inner and outer rings which when screwed together press one
15 or more O-ring seals against the flexible material of the housing. Instead of O-ring seals, the inner and outer rings may be provided with off-set castellations which pinch the flexible material therebetween as the rings are screwed into co-operation. This latter method offers considerable
20 advantages with regard to ease of assembly. The ports may be secured in position in the rings by means of a suitable waterproof cement or adhesive. Alternatively, the outer ring and port for the viewfinder may comprise an integral unit made for example of a transparent material such as "Perspex" (Registered Trade
25 Mark).

In order to maintain the ports in co-operation with the lens and viewfinder of the camera, it is preferred to provide a means of positive location. This is most easily achieved by
30 providing each of the inner fixing rings with an annular collar. In addition to providing a measure of reinforcement, the collar can fit over the extremities of the camera lens and viewfinder thereby positively locating the ports with respect to the lens and viewfinder. Preferably, the inner diameter
35 of the collar on the lens port is sufficient to accommodate the rotation of the camera lens during focusing.

When the camera housing is made from latex, the latex allows the operator to stretch the body sufficiently to enable the collars to be located over their respective camera parts and the resilience of the latex holds the housing in engagement
5 with the ports once the operator releases his grip.

After the camera has been inserted into the housing and the ports located on the camera lens and viewfinder, the housing is ready to be sealed. According to the invention, the sealing is achieved by means of an elongate recessed member and a rod
10 as described herein above. In particular, the flexible material surrounding said opening is held together, the rod member of the sealing apparatus is then placed against the flexible material below the opening and the material wrapped around the rod. The recessed member is then pushed onto the
15 wrapped rod to hold the material together in watertight relationship.

In order to avoid personal injury during use, it is preferred that the length of opening is such that the length of the sealing apparatus does not need to project beyond the end of
20 the viewing port. Optionally, the sealing apparatus can be further secured by additional means such as those described herein above. Once the housing has been sealed, the camera can be used on the beach or underwater without fear of damage being caused by ingress of sand, dirt or water.

25 Unlike the camera bags of the prior art, the sealing apparatus of the present invention is not an integral part of the camera housing and manufacturing costs are therefore significantly reduced. Moreover, it is easy to wash or otherwise clean the sealing apparatus after it has been used on the beach for
30 example without inadvertently introducing sand and/or water into the body of the housing.

The camera housing of the present invention can be provided with a number of optional extras. For example, the housing may

be provided with a carrying handle. Such a handle may, for example, be attached to the recessed member of the sealing apparatus. The attachment of the handle may be by means of a snap fit into a groove or over a projection on the exterior surface of the recessed member, but is more preferably
5 attached by high frequency welding. Alternatively or in addition thereto, a handle may be provided on the bag itself, for example, to help reduce the risk of the operator dropping the camera when filming.

- 10 Further, the base of the interior of the housing may be fitted with a cushion member to protect the bottom of the camera when put down on hard surfaces. The cushion member must not however obstruct the camera controls.

BRIEF DESCRIPTION OF THE DRAWINGS

- 15 In order that the invention may be more readily understood, reference will now be made to the accompanying drawings in which:-

Figs. 1 and 2 are end views of one form of recessed member and one form of rod respectively.

- 20 Fig. 3 is an end view of a rod and recessed member with flexible material interposed between.

Fig. 4 is a side view of a pivot block for the rod, and Figs. 4A, 4B and 4C are front end, rear end and plan views respectively of said pivot block.

- 25 Fig. 5 is a side view of an end cap, Fig. 5A is a section through line A-A, Fig. 5B is a rear end view and Fig. 5C is a front end view of said end cap.

Fig. 6 is a side view of an end cap showing its relationship with the pivot block, and Fig. 6A is a plan view from

underneath.

Fig. 7 is a perspective view of a rod and recessed member in pivotal relationship.

Fig. 8 is a rear end view of an inner block for attaching to one end of a rod for subsequent locking with a clip member, Fig. 8A is a plan view from above, Fig. 8B is a side view, Fig. 8C is a section through line A-A and Fig. 8D is a front end view of said inner block.

Fig. 9 is a side view of a clip member, Fig. 9A is a plan view from above, Fig. 9B is a front end view, and Fig. 9C is a section through line A-A of said clip member.

Fig. 10 is a perspective view from the front of a camera bag with sealing apparatus and Fig. 11 is a perspective view from the rear.

Fig. 12 is a side view of a camera bag.

Fig. 13 is a front end view of a camera bag with sealing apparatus.

Fig. 14 is a section through clamping apparatus for securing the viewing port to the camera bag and Fig. 15 is a section through clamping apparatus for securing the lens port to the camera bag.

Referring to Figs. 1 to 3 of the drawings, the recessed member of the sealing apparatus is indicated at 1. The exterior of the recessed member 1 is provided with projections 3, 5 on which various attachments such as end caps or handles may be fitted, for example by snap engagement. The recessed member is made from resilient plastics material.

The rod 7 is also made from plastics material and is of

circular cross-section, but has a hollow centre into which a metal strengthening rod 9 having the same cross-section as the hollow centre is inserted. The metal strengthening rod does not extend along the full length of the plastics rod but stops
5 short at both ends to allow for the attachment of a pivot block at one end and a latch block at the other end, both of which are described in more detail below.

In use, a container 11 made from latex has two sides 13, 15 adjacent to an opening 17 which are held together and then
10 wrapped around the rod 7. The recessed member 1 which is also made from plastics material has a resilience which enables the portions adjacent the recess to be forced apart to allow introduction of the rod 7 with the material wrapped around. Thereafter the resilience of the recessed member is such that
15 pressure is exerted across the two layers of latex interposed between the rod and the recessed member. This pressure results in a watertight seal being formed across the layers.

Fig. 4 is a side view of a pivot block 21 for attachment to one end of the rod 7 and Figs 4A to 4C are front end, rear end
20 and plan views thereof. Pivot members are shown at 23, 25. The pivot block is provided with engagement means for attaching the pivot block to the rod. The engagement means comprises an elongate extension 27, the shape of which is the same as the hollow centre of the rod 7 so that the extension 27 can be
25 inserted into the rod and held firmly therein. The cross-sections of the hollow centre of the rod and of the extension 27 are such that the rod 7 can be located accurately on the pivot block 21 and relative rotation of the two parts is prevented.

30 Fig. 5 is a side view of an end cap 31 for attachment to the recessed member 1 and for co-operating with the pivot block 21 described above. Figs. 5A to 5C are a section through line A-A, a rear end view and a front end view respectively of the same. The front end 33 of the end cap 31 is provided with

recesses 35, 37 so that the end cap can be snap fitted over the projections 3, 5 of the recessed member 1. The rear end 39 of the end cap is provided with a pair of holes 41, 43 into which pivot members 23, 25 of the pivot block 21 sit.

- 5 Fig. 6 is a side view of end cap 31 showing in broken lines the position of the pivot block within the end cap. The pivot members 23, 25 sit in the holes 41, 43 allowing the two parts to pivot relative to each other. Fig. 6A is a plan view of the same from underneath. As well as holding the rod and recessed
- 10 member in pivotal relationship, the combination of pivot block and the end cap also act to prevent sliding of the rod and recessed member relative to each other. Fig. 7 is a perspective view of the rod 7 and recessed member 1 showing the end cap 31 fitted to the recessed member.

By providing the pivoting mechanism of the sealing apparatus in the form of a pivot block 21 and an end cap 31 which are separate from but attachable to the rod 7 and recessed member 1, considerable savings can be made in the manufacture of the

5 sealing apparatus. This is because both the rod and the recessed member can be made as continuous extrusions which can subsequently be cut to the desired lengths.

- Fig. 8 is a rear end view of an inner block 51 for attachment to the end of the rod 7 remote from the pivoting end. Figs.
- 10 8A to 8D are a plan view from above, a side view, a section through line A-A and a front view respectively of the same. The inner block 51 is provided with engagement means also in the form of an elongate extension 53, the shape of which is the same as the hollow centre of the rod 7. The elongate
- 15 extension is inserted into the end of the rod 7 opposite to the end which holds the pivot block 21. An indentation 59 is provided for receiving a projection of a clip member described below.

A further end cap 31 is attached to the recessed member 1 at

the opposite end from that which is held in pivotal relationship with the rod 7. As described previously, the end cap is attached by snap fitting over the projections 3, 5 of the recessed member. The pair of holes in the end cap are used
5 to receive the pivot members 61, 63 of the clip member 65 shown in Figs. 9 to 9C. A projection 67 is provided on the clip member to co-operate with the indentation on the inner block.

The procedure for using the sealing apparatus as described
10 above is firstly to wrap the layers 13, 15 of latex adjacent to the opening in the container 11 around the rod 7. By means of the pivot block 21 attached to the rod and the end cap 31 which is both snap fitted on the recessed member 1 and pivotally engaged to the pivot block, the rod is then pivoted
15 towards the recessed member and then pushed into the recess. The clip member 65 which is pivotally engaged with the end cap on the 'free' end of the recessed member is then pivoted towards the inner block 51 attached to the end of the rod. The projection 67 on the clip member is then pushed into the
20 indentation 59 thereby ensuring that the rod and recessed member are maintained in co-operation with the layers of latex interposed therebetween.

Fig. 10 is a perspective view from the front of a camera bag 71, the opening 17 of which is sealed with the sealing
25 apparatus of the present invention and Fig. 11 is a partial rear view of the same. The bag 71 is made from latex and is provided with a lens port 73 and viewing port 75 which co-operate with the lens and viewfinder respectively of the camera which is enclosed in the bag. The main body of the bag
30 is profiled to follow the major contours of the camera. A carrying handle 77 is snap fitted over the recessed member and a further handle 79 is attached to the side of the bag. The handle 79 enables the hand of the camera operator to be inserted between it and the bag thus guarding against dropping
35 the equipment.

Fig. 12 is a side view of the camera bag 71 prior to attaching the sealing apparatus. Above the main body 81 is the opening 17 and sufficient material is provided between the two to allow for the material to be wrapped around the rod of the sealing apparatus without distorting the overall shape of the main body, as shown for example in Fig. 13.

Figs. 14 and 15 show clamping apparatus for securing the viewing port and lens port respectively to the camera bag. The viewing port 75 is a planar, circular member made from "Perspex" or other suitable transparent material. The underside of the port 75 is recessed with the sides of the recess being provided with a screw thread to co-operate with a screw thread on an inner ring 91. Castellations 93, 95 are provided on each of the viewing port and inner ring and are arranged in off-set relationship such that the material of the camera bag is pinched firmly between the castellations when the two parts are screwed together. The resilience of the latex from which the bag is made ensures that the seal formed by the clamping members is watertight. Both the viewing port and the inner ring can be made for example by injection moulding.

A similar arrangement is used for attaching the lens port to the camera bag. It is preferable to use a port which is of high optical grade in order to ensure that the quality of the photographs or films does not suffer by shooting through the lens port. In Fig. 15, such a port is made by cementing a lens 97 to an outer ring using water resistant cement 101. The outer ring 99 is provided with castellations 93 and a screw thread similar to the viewing port described above, and this is then screw threaded onto an inner ring 103 with the latex of the camera bag being pinched in between. The diameter of the lens port is advantageously larger, for example at least 2mm larger, than the lens hood of the camera thereby enabling the autofocus to move the front element of the lens.

Each of the inner rings of both the viewing port and the lens port are made in such a way as to provide annular collars 105, 107 extending into the interior of the bag. The annular collars provide a means of positive location with the
5 viewfinder and the lens. While the embodiment described shows the collars to be an integral part of the inner rings, the collars could alternatively be provided separately and, for example, be screw fitted or friction fitted to the inner rings.

10

Although preferred embodiments have been described, it should be appreciated that the invention includes all modifications and variations falling within its scope.

Claims:-

1. Sealing apparatus comprising an elongate recessed member and a rod which in use is wrapped with at least two layers of flexible material and inserted in the recess of the recessed member to form a watertight seal between said at least two layers of flexible material.
2. Sealing apparatus according to claim 1 wherein the recess of the elongate recessed member extends along the longitudinal axis thereof.
3. Sealing apparatus as claimed in claim 1 or 2, wherein the recessed member is comprised of a resilient material.
4. Sealing apparatus according to claim 3 wherein the recessed member is comprised of plastics material.
5. Sealing apparatus according to any of the preceding claims wherein the recessed member is substantially circular in cross-section.
6. Sealing apparatus according to any of claims 1 to 4 wherein the recessed member is generally U-shaped in cross-section.
7. Sealing apparatus according to any of the preceding claims wherein the rod is circular or U-shaped in cross-section.
8. Sealing apparatus according to any preceding claim wherein the rod is made from a plastics material and has a hollow centre for receiving a strengthening insert.
9. Sealing apparatus according to claim 8 wherein the cross-section of the hollow is generally rectangular with one pair of opposing sides being arcuate and the strengthening insert has the same cross-section.

10. Sealing apparatus according to claim 8 or claim 9 wherein the strengthening insert is made of metal.

11. Sealing apparatus according to any of the preceding claims wherein the rod extends in use beyond the end of the recess
5 member.

12. Sealing apparatus according to any of the preceding claims wherein the recessed member is pivotally attached at one end to the rod.

13. Sealing apparatus according to claim 12 wherein a pivot
10 block is attached to one end of the rod and an end cap is attached to one end of the recessed member, said pivot block and said end cap being attached to each other in pivotal relationship.

14. Sealing apparatus according to claim 13 wherein the pivot
15 block is attached to the end of the rod by means of an extension which is inserted and retained in a hollow centre provided in said rod.

15. Sealing apparatus according to any preceding claim wherein the recessed member and rod are manufactured as continuous
20 extrusions.

16. Sealing apparatus according to any of the preceding claims wherein securing means are provided to keep the rod and recessed member in co-operation in use.

17. Sealing apparatus according to claim 16 wherein the
25 securing means comprises a pivoting catch member attached to one end of the recessed member and retaining means for co-operating with said catch member attached to the corresponding end of the rod.

18. Sealing apparatus according to any preceding claim in

combination with a flexible container.

19. Sealing apparatus according to claim 18 wherein said flexible container is in the form of a camera bag.

20. A method of providing a watertight seal across an opening
5 in a container made from flexible material using sealing apparatus as claimed in any of the preceding claims, said method comprising wrapping said material adjacent to but spaced from said opening around a rod and inserting said rod into a recess of a recessed member such that said recessed
10 member holds said flexible material around said rod in a watertight manner.

21. A watertight container comprising a hollow body, an opening communicating with said body, a flexible sleeve defining the opening and sealing means associated with the
15 flexible sleeve wherein the sealing means comprises first and second clamp members co-operable to close around the flexible sleeve to seal the opening.

22. A watertight container as claimed in claim 21, wherein the first clamp member includes a recess capable of receiving at
20 least a portion of the second clamp member, with the flexible sleeve being trapped in the recess between the first and second clamp members.

23. A watertight container as claimed in claim 22 wherein the recess is elongate and the second clamp member comprises a
25 rod.

24. A watertight container as claimed in claim 23 wherein the sealing means comprises apparatus according to any of claims 1 to 17.

25. A watertight container as claimed in any of claims 21 to
30 24 wherein the container is a camera housing.

26. A camera housing comprising a waterproof, flexible, resiliently stretchable material.
27. A camera housing having a flexible opening through which a camera can be introduced, said opening being sealed by means
5 of sealing apparatus as claimed in any one of claims 1 to 17.
28. A camera housing according to claim 27 wherein said housing is flexible.
29. A camera housing according to claim 28 wherein the flexible housing comprises a resilient material.
- 10 30. A camera housing according to claim 29 wherein said resilient material is also stretchable.
31. A camera housing according to claim 26 or claim 27 wherein the housing comprises natural or synthetic rubber.
32. A camera housing according to claim 31 wherein said rubber
15 is neoprene.
33. A camera housing according to any of claims 26 to 33 wherein the housing comprises a main body whose shape generally follows at least some of the major contours of the camera with which it is intended to be used.
- 20 34. A camera housing according to claim 33 wherein the housing is in the form of a bag, the lower portion of the bag being comprised of said main body and the upper portion of the bag in the form of a flexible sleeve extending from said main body.
- 25 35. A camera housing according to any of claims 26 to 34 wherein said housing is provided with a lens port and a viewing port for co-operation with the lens and viewfinder of the camera.

36. A camera housing according to claim 35 wherein each of said lens port and said viewing port is comprised of an inner and outer ring which have complementary screw threads and offset castellations such that when said rings are screwed
5 together the material of the housing is pinched between the castellations to form a watertight seal around said ports.

37. A camera housing according to claim 36 wherein one or both of said inner rings is provided with an annular collar for fitting over the lens and/or viewfinder of the camera.

10 38. In combination, a camera and a camera housing as claimed in any of claims 26 to 37.

39. Sealing apparatus as claimed in claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

15 40. A watertight container as claimed in claim 18 substantially as hereinbefore described with reference to the accompanying drawings.

41. A camera housing as claimed in claim 26 or 27 substantially as hereinbefore described with reference to the
20 accompanying drawings.

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Relevant Technical fields

(i) UK CI (Edition K) B8K (KBA, KBB)

(ii) Int CL (Edition 5) B65D 33/16

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

G NICHOLLS

Date of Search

17 JULY 1992

Documents considered relevant following a search in respect of claims
Claims 31-38 and 41 insofar as they are dependent on Claims 27-30 1-25, 27-30, 39-40 AND

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1506457 (FRANKLIN) - whole document	1-5, 7, 11, 16, 18, 20-24
X	EP 0342317 A2 (MULLER) - whole document	1-5, 7, 18, 20
X	WO 88/02727 A1 (PLASTBOLAGET UDDMO) - whole document	1-4, 6, 7, 12, 16, 18, 20
X	US 5050272 (ROBINSON) - whole document	1-4, 6, 12, 16, 18, 20
X	US 4887335 (ICE PACK) - whole document	1-4, 6, 12 16, 18, 20

SF2(p)

me - doc99\fil000091

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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